

A User Experience on Rover Technology

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## **Abstract**

### **Background**

This study seeks to understand usability of Rover technology by staff nurses at a large Midwest academic medical center. Nurses use Rover, a hand-held device, to facilitate patient care. This study explores nurses' perceptions of advantages and disadvantages of Rover, and about what facilitates or hinders use. Findings can be used to guide administrators in helping nurses make best use of the technology, and for working with the vendor to improve the technology.

### **Theoretical Framework**

The Health Information Technology Evaluation-Level 3, a stratified view of health IT usability evaluation which considers interactions between user, technology, task and environment, served as the framework for this study (Yen & Bakken, 2011). In this study, we assess nurses' perceptions of interactions between the nurse-user, Rover tasks, and the hospital setting.

### **Method**

The sample consisted of fourteen registered nurses from high- and low-Rover-use hospital units. Nurses were recruited through their nurse managers and were approached by the researcher to participate in the study, which was conducted over a six-month period. Nurses completed a demographic survey; individual data was coded, and location of practice reported as frequencies. Nurses were interviewed by a single researcher using a semi-structured interview guide that asked questions about their use of the Rover technology. Interviews were transcribed and coded for overarching themes.

### **Findings**

Rover features beneficial to participants' work included accessibility to basic flowsheets, the Medication Administration Record, and the camera feature and similarities to standard smart phones. Features participants indicated could use improvement included overall physical design,

lack of flowsheets for in-depth charting, and IT connectivity issues. Participants also identified additional features to enhance Rover usage. Transferability of our findings is limited by sample size, and that Rover was the only proprietary brand studied.

### **Conclusions**

Nurses found Rover a useful adjunct to their work, and were satisfied with certain features. However, certain features are less useful, could be improved, or could be changed. Nursing leadership anticipates using these findings for 1) working with sales representatives to modify the technology and 2) facilitating greater efficiencies between technology and nursing work.

## A User Experience on Rover Technology

### **Introduction**

This study examined nurses' experience with handheld technology, specifically mobile devices such as smartphones that are equipped with multiple capabilities. While personal digital assistants (PDAs) were once the most common handheld technology used in the healthcare industry, research is now focused on mobile devices that are multi-functional. Studies have concluded that mobile devices, like stethoscopes, are gradually becoming an important and necessary tool for healthcare workers to have available to them (Farrell, 2016). The Ohio State Wexner Medical Center (OSUWMC) has begun using Rover Technology, mobile documentation for nursing. Rover is equipped with the electronic medical record system, Epic, that is available to nurses for patient care and documentation purposes. Rover has been implemented on the majority of units at the OSUWMC; however, Rover is not used equally across units and little is known about how and when nurses are using this technology. This study explores how the Rover Technology is being utilized and nurse's perceptions of this new technology in comparison to the traditional computer monitors available in the hallways and nurse's stations of the OSUWMC.

The Applied Research Internship Program Committee at OSUWMC is a committee that identifies clinical questions that need answers which can be approached through either clinical projects or research. The author's mentor is a member of this practice/academic partnership committee, and was able to link the author/student and the committee. The author/student selected the Rover use question as a research topic of interest.

### **Review of the Literature**

The databases utilized to conduct this literature review were CINAHL and PubMed via The Health Science Library's Database at The Ohio State University. The keywords and phrases entered into the databases included: (a) mobile devices in nursing, (b) in patient setting, (c) technology assist devices, and (d) user interface. All articles examined were peer reviewed and published within the past 10 years, between the years of 2009 and 2018. The following literature review details the increasing presence and influence of technology in the healthcare industry including the presence of multi-functional mobile devices, the advantages and disadvantages of these mobile devices, and the identified gap in the literature: few studies to date are focused on nurses' perceptions of this technology.

### **Technology in the Healthcare Industry**

Technology has become an increasingly present part of our healthcare system in recent years. Previous studies that discussed technology's influence in the healthcare industry focused on personal digital assistants (PDAs) and their use within the healthcare industry (Wallace et al., 2012). PDAs are defined as small hand-held computers that are capable of performing multiple functions such as scheduling and accessibility to medical references (Ho et al., 2009). As technology has evolved, there has been a shift in research interest away from PDAs and towards mobile devices that are equipped with multiple functions, such as the iPhone or Android, and their role in clinical practice (Wallace et al., 2012). Mobile devices can be found in healthcare systems across The United States and abroad. Although each healthcare system has tended to create their own mobile devices to utilize for clinical practice, many of the mobile devices are equipped with the same functions (Venola, 2014). This is consistent with OSUWMC's multi-

functional mobile device known as Rover. Rover is a hand-held device that nurses utilize to facilitate patient care. It is equipped with the the medical center's documentation program, Epic. Nurses can therefore utilize this device for many areas of patient care including documenting patient care assessment and administering medications.

### **Advantages of Mobile Devices in Healthcare**

After examining the current literature regarding the use of mobile devices in clinical practice, several advantageous factors became clear. One of the most frequently identified advantages of mobile devices is enhancement of communication. One study found that communication was the primary reason for usage of their particular mobile device (Tran et al., 2014). Familiarity with personal mobile devices, in particular cellphones, for texting and calling has also eased the introduction of mobile devices and communication within the hospital setting. One study illustrated enhanced communication due to mobile devices when they were able to contact the physician via mobile device without leaving the patient's bedside (Farrell, 2016). Another study focused on mobile devices within the home-care setting and found that nurses reported decreased levels of workload and stress because of the simplified nature of the specific mobile device (Chiang & Wang, 2016). Mobile devices not only provide for effective communication but also assist with strategic practice and efficiency. This results in the ability for quicker decisions to be made so quicker treatments can be implemented. In a particular study, participants reported approximately 30% less efficiency without their mobile devices (Nerminathen et al., 2017). Another factor that contributed to strategic practice and increased efficiency with mobile devices included the ability to rapidly gather information (Rashid et al, 2016). An additional frequently discussed advantage of mobile devices is enhanced teamwork and collaboration. Because mobile devices provide for easy communication, collaboration

regarding individual patient treatment plans have improved. Mobile devices also serve as an educational tool as they are often equipped with educational apps that are helpful for learning and confirming treatments and medications (Nerminathan et al., 2017).

### **Disadvantages of Mobile Devices in Healthcare**

Despite the many advantages associated with the presence mobile devices in healthcare, there are also several disadvantages and/or barriers to usage to consider. It is not uncommon for healthcare workers to continue to work into what was considered retirement age by past generations; however, with advancing technology they may need to change their work habits and adapt to new technology (Farrell, 2016). One study found that as one's age increases, the likelihood of owning a mobile device decreases plummets. For example, 95% of the millennial population owns a cellphone where as only 68% of the Silent Generation (66-74 years of age) own a cellphone (Zickuhr, 2011). Lack of familiarity with mobile devices may deter older generations from utilizing this technology within the healthcare setting. Because mobile devices are multi-functional and often equipped with additional applications such as social media applications (Facebook, Twitter, etc.), there is a risk of mobile devices acting as a mode of distraction in the workplace (Motulsky et al., 2016). It is easy to become absorbed in technology and there is some debate over whether technology should be used at the bedside. While this new technology can be exciting and advantageous, mobile devices may also increase patient errors and decrease workplace efficiency (Ehrler et al., 2012). Identified distractions that resulted from mobile device usage included distraction from bedside learning and development of a relationship with the patient (Rashid et al., 2016). In addition to risk of distraction, there is also concern among health care providers that mobile devices may be viewed as a form of unprofessionalism from the perspective of the patient. In fact, healthcare providers report feeling

more comfortable using mobile devices in front of younger patients as they are active users of this new technology (Dimond et al., 2017). These disadvantages are important to keep in mind when considering usage of mobile devices within the healthcare setting

### **Gap in the Literature**

After examining the literature surrounding mobile devices in the healthcare setting it became clear that very few studies to date are focused on nurses' perceptions of this technology (Farrell, 2016). The majority of studies focus on perceptions of physicians or medical students. In addition, there are no studies to date that specifically focus on OSUWMC's Rover Technology. Therefore, research focused on mobile devices should expand to include nurse's perceptions of mobile devices as well as team-based collaboration between nurses and physicians.

### **Study Aim**

The aim of the Rover Study was to understand the usability of Rover technology by staff nurses. Nurses at the OSUWMC, including Harding Hospital and The James Comprehensive Cancer Center use the Rover, a hand-held device to facilitate patient care. Rover usage volume varies between hospital settings and units; this study sought to understand nurses' perceptions of the advantages and disadvantages of using Rover, and about conditions that facilitate use versus conditions that hinder use. It is the intention that study findings will be used to guide administrators in helping nurses make best use of this technology.

### **Theoretical Framework**

The Health Information Technology Evaluation (HITE)-Level 3, a stratified view of health IT usability evaluation which considers the interaction between user, technology, task and the environment, served as the theoretical framework for this study (Yen & Bakken, 2011). The



aim of this framework is to incorporate environmental factors to identify work processes and system impact in a real world setting. The stratified view is advantageous in that it provides a clearer explanation of the interactions and factors that influence the relationships between user, technology task, and the environment. Outcomes that the HITE-Level 3 seeks to measure and examine include accuracy, speed, completeness, interaction, and perception. In this study, we sought to understand and clarify nurses' perceptions of interactions between the nurse-user, Rover tasks, and the hospital setting.

### **Methods**

The relatively small qualitative study was conducted on hospital units at OSUWMC, specifically Harding Hospital and The James Comprehensive Cancer Center. Semi-structured interviews were conducted during Spring 2017 at The James and Fall 2017 at Harding Hospital. Nurses were recruited through permission/access by their nurse managers and were then approached in-person to volunteer to participate in the study. Purposive sampling yielded a total sample of 14 registered nurses. The sample consisted of seven registered nurses from two designated units at The James (18 James and 20 James) and seven registered nurses from two designated units at Harding Hospital (3NP and 4NP) who use Rover Technology. The eligibility and inclusion criteria for participation in this study includes: 1) Bachelors of Science (BSN) prepared full-time Registered Nurses (RNs), 2) RN with a minimum of two years of experience at James Comprehensive Cancer Center/Harding Hospital, and 3) staff nurse position. Exclusion criteria: masters or doctoral preparation in nursing.

### **Procedure**

This study's research protocol was approved by The Ohio State University Institutional Review Board (IRB). Nurses were introduced to the study purpose and data collection processes

using a verbal script, and verbal consent was obtained during the scripted conversation. Nurses were individually interviewed by a single researcher, Lindsey C. Welch, an Honors BSN nursing student from OSU College of Nursing, who was supervised by Jacqueline Loversidge, PhD, RNC-AWHC, a faculty member of OSU College of Nursing and the study P.I. Interviews took place at The James and Harding Hospital in quiet, private designated conference rooms.

Ms. Welch used a semi-structured interview guide that was derived by working with the client and research team so that questions would circle back to the research question and known issues discovered during the review of the literature. The semi-structured interview guide specifically asked questions about the nurse's use of the Rover technology. Semi-structured qualitative interviewing is helpful in that it aims to inquire about the participant's individual point of view and world views (Wengraf, 2001). In addition, qualitative interviewing is flexible and allows the researcher to diverge from the interview guide to seek clarification or follow-up on a participant's specific reply. Nurses also completed a demographic survey including age, gender, education in nursing, position (e.g., "staff nurse"), and location of practice in the organization (e.g. The Ohio State University Wexner Medical Center (OSUWMC) (i.e. "University Hospitals" buildings, such as Doan Hall or Rhodes Hall), Harding Hospital, or The James Comprehensive Cancer Center, and unit), and years of experience as an RN, and at OSUWMC/The James/Harding Hospital.

The surveys were coded using a numbering and letter system that protected individual identity/data. Interviews lasted between 5 minutes to 18 minutes in length, not including administration of demographic survey. The researcher also made additional field notes during interviews to accommodate for facial expressions or reactions that are unable to be accurately

portrayed via recording. The discussion was recorded, with participant permission, and professionally transcribed verbatim.

### **Data Analysis**

Interviews were transcribed verbatim and participant perspectives on Rover Technology were analyzed for overarching themes discussed during the interviews. A total of four rounds of coding were completed. Data reduction was consistent with Miles and Huberman's (1994) process of selecting, simplifying, abstracting, and transforming data originating from transcriptions and field notes. A synthesis process was utilized to identify all nursing activities participants performed utilizing Rover Technology, and these specific activities were grouped into descriptive and explanatory categories. Although the sample size was relatively small, a level of data saturation was reached, allowing the researchers to have confidence in the findings and thematic analysis.

Themes emerged from the coding process that represented nurses' experience relative to Rover Technology use including, ease of accessibility to chart, patient care assessment, and physical design flaws. Demographic data was reported in aggregate form, with data on age and gender reported as ranges. Data on location of practice was reported as frequencies, and de-identified data linked to de-identified findings from the interviews, to determine whether physical location in the organization was associated with greater or lesser Rover use.

### **Findings**

Following completion of the 14 interviews at The James and Harding Hospital, interview recordings were uploaded to a professional transcription website and transcribed verbatim. This produced 14 transcripts which were then analyzed utilizing the data reduction process described by Miles and Huberman (1994). Four rounds of coding were performed which allowed several

themes to unfold. The transcripts were first read several times through. Next, the transcripts were highlighted and color-coded. Each color represented an identified theme.

Coding revealed several themes that focused on the advantages of Rover such as ease of accessibility to chart, patient care assessment, and patient safety. The questions in the semi-structured interview guide utilized when conducting the interviews had asked nurses to reflect on their experience and perception of Rover, with foci on the advantages and disadvantages of Rover, favorite and least favorite features, and recommendations to improve Rover and its future usage. Coding additionally revealed two themes that were overall disadvantages of Rover: physical design flaws and organizational support.

### **Positive Aspects of Rover Use**

All participants were able to correctly identify the location of Rovers on their respective units, indicating Rover accessibility is unproblematic. Nearly all participants mentioned the accessibility to the Medication Administration Record (MAR) and its handiness in administering medications safely to patients when they are on or off-unit. They were pleased with the ability to verify the five rights of medication administration prior to administering the medication and the ability to document the administration of the medication in real time. One nurse said that *“I think it’s nice that if patients are off the floor and need a medication, you can take it down with you and still scan everything.”* The majority of participants utilized the MAR on the Rover only for PRN or single medication administrations rather than the more complex morning medication passes when they are required to administer multiple medications to several patients.

In addition, the majority of participants reflected positively on the usability of the medication scanner that the Rover is equipped with. Participants also mentioned that they utilized the Rover for other quick documentation purposes such as hourly rounding, 15-minute

patient checks, and vital signs. Participants also expressed that the Rover allowed them to cluster care for their patients as documentation is quick and convenient. Participants from Harding Hospital noted that the Rover was a more personable patient care approach and less overwhelming for anxiety-prone and paranoid patients than the large portable computers typically used for patient care.

Participants indicated they appreciated the Rover camera feature. Many of the patients on the units at The James have wounds and/or drains that must be closely monitored. The participants from these units indicated the camera feature helped them to precisely track the progression of these wounds in a way that documentation does not always accurately portray, and also in a way that protects the patient's image data. One nurse said that, *"Being able to track wounds is a huge advantage where you can go and see...an IV vesicant the way it progresses to make sure it's...healing the way we want to."* At Harding Hospital, participants also mentioned the ease of use of the camera feature. In particular, this feature was used for clinical images and patient identification as these units must take pictures of their patients for correct identification.

Participants were also satisfied with the convenient portability of the Rover device and its similarities to the standard smartphone. Participants mentioned that previous personal experience with smartphone technology made the transition to using the Rover fairly seamless. In addition, participants mentioned that having access to the Rover as an alternative device available for charting, made the portable computers and desktop computers more readily available on the units.

### **Suggestions for Rover Improvement**

Participant suggestions focused primarily on making small changes to Epic, such as adding additional Flowsheets. For example, the participants from The James mentioned the

addition of flowsheets would facilitate the frequent drain intake and output documentation required. Participants expressed that if the Rover was equipped with the intake/outtake flowsheet, they would use the device more frequently. Participants from Harding Hospital also mentioned that the “Notes” feature, a feature used frequently on these units, was not available on the Rover. Some participants also expressed that it was difficult to see when medications were “due” and “overdue” within the Medication Administration Record on the Rover. In addition, some participants did not like utilizing the MAR on Rover, specifically when there are clarification questions that accompany the medication administration. Some participants suggested that the full assessment flowsheet and notes feature be included as an option for those that like to complete the majority of their charting on the Rover. Overall, many participants seemed to be interested in equipping the Rover with additional features of Epic that are available on the desktop computers such as additional flowsheets for documentation.

The size of the Rover was also a concern for some participants as they felt it was bulky in its current case-wrapping. Participants commented that the protective cover hinders access to some of the icons and keyboard on the Rover screen making it difficult to document. The small size of the keyboard was also a concern for several participants who felt it was difficult to document on. One nurse said that “...*The screen feels a bit small. The buttons are small...especially the furthest buttons off to the side. It’s sometimes hard to hit those.*” Most participants did not carry the Rover with them throughout their shift because of the size, but rather used the Rover as needed and then returned it to the docking station. Participants expressed that if the device was slightly smaller they would be more likely to use the Rover more often. Participants did mention that the Rover was an improvement from iPads previously utilized on their units. Several participants also suggested a future Rover design that is equipped

with a messaging or calling feature, similar to the Cisco phones, to allow them to carry one device equipped with all the features they desire during their shift. An additional suggestion by several participants was a policy regarding cleaning the Rover devices between patients to decrease the chance of infection transmission.

There were some concerns regarding connectivity of the Rover to IT support. One of the units in particular had reported that Rovers shut down sporadically, and therefore fewer staff are using the device. Many participants also expressed they would like to receive more education on the Rover as they had not had a “formal” training for Rover from the IT department. One nurse said that *“I think education might be helpful because there are a lot of nurses on the unit who actually don’t know how to use the Rover.”* Overall, participants from Harding Hospital utilized The Rover less frequently than participants from The James. Therefore, participants from Harding felt they had to “re-learn” the Rover each time they used it because they were less familiar with the device capabilities than participants from The James. Participants also suggested IT make rounds to the units in an effort to ameliorate or correct some of the connectivity issues.

Samples of exemplar quotes, organized by theme, appear in Table 1:

Table 1: Rover Research Project Exemplar Themes and Quotes

Theme	Exemplar Quote
Ease of accessibility to chart	<p>“I could carry it in my pocket and, say, I’m off the unit...and someone calls me...I can just look and click on there and say, ‘Oh, yeah. This was their last vital signs,’ or, ‘Oh, here’s their labs . . .”</p> <p>“I think it’s nice that if patients are off the floor and need a medication, you can take it down with you and still scan everything.”</p>

Patient care assessment	<p>“...Being able to track wounds is a huge advantage where you can go and see...an IV vesicant the way it progresses to make sure it’s...healing the way we want to”</p> <p>“I had a family saying that the patient’s face was...more swollen...where the medical team thought it looked the same. I took a picture at the beginning of my shift and put that in the chart...there was more swelling and then the team could actually see that.”</p>
Physical design flaws	<p>“It’s a little bit bulky...it’s a little awkward because I’m usually carrying other stuff...”</p> <p>“...The screen feels a bit small. The buttons are small...especially the furthest buttons off to the side. It’s sometimes hard to hit those.”</p>
Patient safety	<p>“...I think it has a positive impact...it obviously is increasing safety when you’re able to scan a med [medication] in a testing procedure. Like, for example, radiation oncology has no scanners available for the RN to use.”</p>
Organizational support	<p>“I think education might be helpful because there are a lot of nurses on the unit who actually don’t know how to use the Rover.”</p>

In addition to the semi-structured interviews, participants completed a demographic survey at the conclusion of their respective interview. Participants were of a wide age range with the youngest participant being 24 years of age and oldest participant being 55 years of age. The average age of participants was 32.5 years of age. 92% of participants (13 of the 14) were female. In terms of educational preparation, 12 of the 14 participants held a BSN degree while the other two participants held an ASN degree. All participants identified themselves as Staff RNs. Participants also had a wide range of experience as RNs. Years of experience as an RN ranged from 7 months to 16 years with the average years of experience being 6.18 years. The average years of experience at OSUWMC was 5.46 years. One participant reported previous handheld device experience. 92% of participants reported no previous handheld device experience. The demographic data reveals the participants were of a variety of ages and had varying years of experience as RNs.



### **Discussion**

A total of 14 interviews were conducted on four hospital units at the OSUWMC using a semi-structured interview guide that aimed to understand nurses' perceptions of Rover Technology. After analyzing the interview transcripts, four overall themes were identified that reflected the advantages and disadvantages of mobile devices in healthcare. The transcripts also revealed specific suggestions to improve Rover Technology and its future usage at the OSUWMC.

The first theme that emerged was ease of accessibility to the chart; nurses found the accessibility to the medication administration record (MAR) to be most beneficial. The second theme identified was patient care assessment. Nurses found the camera feature of the Rover helpful when monitoring wounds and drains. The third theme that emerged following data reduction was physical design flaws of the Rover. The large size of the case was a common concern of nurses as well as the small size of the keyboard. The fourth theme that was identified was patient safety. Nurses felt that having access to the MAR when the patient was off-unit added in an extra-safety check that would not exist without the Rover. The final theme identified was organizational/IT support. Nurses were unaware of some of the capabilities of the Rover and wished to learn more about the device through education from the IT department.

Suggestions for Rover improvement included making small changes to Epic to go with the Rover, such as adding additional flowsheets, and adding the "Notes" feature that is not currently available on Rover. Improving the visibility of the "due" and "overdue" notification features on the Medication Record on Rover was also mentioned, as well as the difficulty of using the MAR on the Rover at all.

The size of the Rover, and its connectivity were also issues that might be attended to, either by the manufacturer, or the hospital administration/infrastructure. The need for additional support from the organization's IT department was noted.

### **Limitations**

This study was conducted in a single institution in a large academic medical center in the Midwest, as a part of a quality improvement program. The aim of the study was to inform improvements in the use of Rover technology in this particular nursing staff population. As such the results are not transferable to other institutions, or other types of hand-held technology.

### **Conclusions and Recommendations**

The data from the collective interviews provides a good deal of information for helping the organization understand Rover use by nurses on these units, its advantages, and factors that could enhance Rover usage and device satisfaction. Participants identified features of the Rover that are beneficial to their work, and also identified features that they do not use as frequently and feel could use some improvement. Our participants also assisted us by identifying features they would like to see added to the Rover that would enhance their usage of the device. As a whole, the information our participants provided us with regarding Rover will help Rover technologists make changes to the design and software that will best assist staff nurses in patient care. Our recommendations are to re-visit the design of the Rover to ease usage, integrate more features of Epic onto the Rover such as flowsheets, and collaborate with IT to ensure Rovers are functional on the units. Additional interviews at other facilities and units in the OSUWMC will be helpful in identifying unit-specific preferences that positively and negatively impact Rover usage.

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